

**EXHIBIT 1 FOLLOWS THIS
DIVIDER PAGE**

Exhibit 1

**Physics of
Semiconductor Devices**

SECOND EDITION

S. M. Sze

*Bell Laboratories, Incorporated
Murray Hill, New Jersey*

A WILEY-INTERSCIENCE PUBLICATION

JOHN WILEY & SONS

New York • Chichester • Brisbane • Toronto • Singapore

Exhibit 1

Copyright © 1981 by John Wiley & Sons, Inc.

All rights reserved. Published simultaneously in Canada.

Reproduction or translation of any part of this work beyond that permitted by Sections 107 or 108 of the 1976 United States Copyright Act without the permission of the copyright owner is unlawful. Requests for permission or further information should be addressed to the Permissions Department, John Wiley & Sons, Inc.

Library of Congress Cataloging in Publication Data:

Sze, S. M., 1936-

Physics of semiconductor devices.

"A Wiley-Interscience publication."

Includes index.

I. Semiconductors. I. Title.

TK7871.85.S988 1981 537.6'22 81-213
ISBN 0-471-05661-8 AACR2

Printed in the United States of America

10 9 8 7 6 5 4 3 2

Exhibit 1

Appendix I

Properties of SiO₂ and Si₃N₄ at 300 K

Insulator:	SiO ₂	Si ₃ N ₄
Structure	Amorphous	Amorphous
Melting point (°C)	~1600	—
Density (g/cm ³)	2.2	3.1
Refractive index	1.46	2.05
Dielectric constant	3.9	7.5
Dielectric strength (V/cm)	10 ⁷	10 ⁷
Infrared absorption band (μm)	9.3	11.5–12.0
Energy gap (eV)	9	~5.0
Thermal-expansion coefficient (°C ⁻¹)	5×10 ⁻⁷	—
Thermal conductivity (W/cm-K)	0.014	—
dc resistivity (Ω-cm)		
at 25°C	10 ¹⁴ –10 ¹⁶	~10 ¹⁴
at 500°C	—	~2×10 ¹³
Etch rate in buffered HF ^a (Å/min)	1000	5-10

^aBuffered HF: 34.6% (wt.) NH₄F, 6.8% (wt.) HF, 58.6% H₂O.

IN

Abr
Abr
de
ge
on
sp
Abs
co
ac
Acc
Acc
de
Acc
Acc
of
of
Acc
Acc
Acc
lo
pl
tr
Act
Act
Al-S
Alk
Alle
m
Alp
va
AlQ
co
AlQ
AlQ
AlI
Al₂

EXHIBIT 2 FOLLOWS THIS
DIVIDER PAGE